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Synonomies in the *Archachatina churchilliana* group (Mollusca: Pulmonata)

by

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ABSTRACT

Breeding experiments demonstrate that the taxa *Achatina churchilliana* Melvill & Ponsonby, 1895, and *Archachatina sanctaeluciae* van Bruggen, 1989, both currently referred to the genus *Archachatina,* are conspecific. It is further concluded that *Achatina zuluensis* Connolly, 1939*,* cannot be differentiated from the above two species solely on characters of the shell, and that it is probably another junior synonym of *A. churchilliana.*

INTRODUCTION

A number of species of the pulmonate family Achatinidae have been described from the South African province of KwaZulu-Natal. Two of these, *Archachatina sanctaeluciae* van Bruggen, 1989, and *Archachatina zuluensis* (Connolly, 1939) are similar to most members of Achatinidae in having flammulate shells. According to van Bruggen (1989), a specimen collected by H. P. van Hoepen at Mapelane resembles one of these species in some characters of the shell and the second species in others. He concludes that this specimen, with its distinctly dome-shaped apex, should provisionally be referred *to A. sanctaeluciae.*

Two additional species with uniformly pale yellow shells, *Archachatina churchilliana* (Melvill & Ponsonby, 1895), and *Achatina natalensis* Pfeiffer, 1854, were also described from this area. According to Connolly (1925 1939), these two are closely allied but can be distinguished by *A. churchilliana* having a slightly broader apex and rather longer and less convex whorls. The lack of any further records other than the original three specimens of *A. natalensis* led Bequaert (1950) to conclude that the given type locality of Port Natal (= Durban) was erroneous and that it is not even a South African species. This problem will be dealt with in a separate paper (Sirgel, in prep.).

At first sight it seems as if the four above-mentioned species can easily be distinguished by their shells being flammulate or not. The flammulate pair, according to van Bruggen (1989), differ from one another in *A. sanctaeluciae* having: (1) a more slender shell, resulting in a higher length/diameter ratio, (2) the ratio of total length/length of last whorl being higher, (3) the apex being coarser and more domed, and (4) the columella showing a noticeable twist which is absent or very weak in *A. zuluensis.* The yellow shell of *A. churchilliana* normally further differs from that of the flammulate *A. sanctaeluciae* in being shorter and relatively more obese. It should, however, be borne in mind that quite a high degree of variation exists in shell shape within each of these species (Sirgel 2000, figs 9 & 10) and within many other achatinid taxa.

Such intraspecific variation in shell shape results in a slight overlap in the morphometrics of some of these taxa (van Bruggen 1989; Sirgel 2000). This casts doubt on the validity of shell characters alone as a sound basis for their differentiation. Mead (1950 1979) and van Bruggen (1972) emphasised that in addition to shell characters, the anatomy of the genital system in the Achatinidae should be taken into account, in order to reach a meaningful evaluation of their relationships and phylogeny.

Dissections of *A. zuluensis, A. sanctaeluciae and A. churchilliana,* as well as a specimen with a widely domed apex to its shell (i.e. similar to that which van Bruggen (1989) provisionally referred to *A. sanctaeluciae*), revealed that the anatomy of the fully developed genital system was similar in all (Sirgel 2000). This strengthens the suspicion that they could all be variations of one extremely polymorphic species. A complicating factor in this respect, however, is that the penial structure is fully developed only at a very late stage. Consequently, the underdeveloped penis in an apparently adult specimen might mislead one into thinking that its anatomy differs significantly from that of other fully developed specimens, and that this indicates taxonomic distinctness.

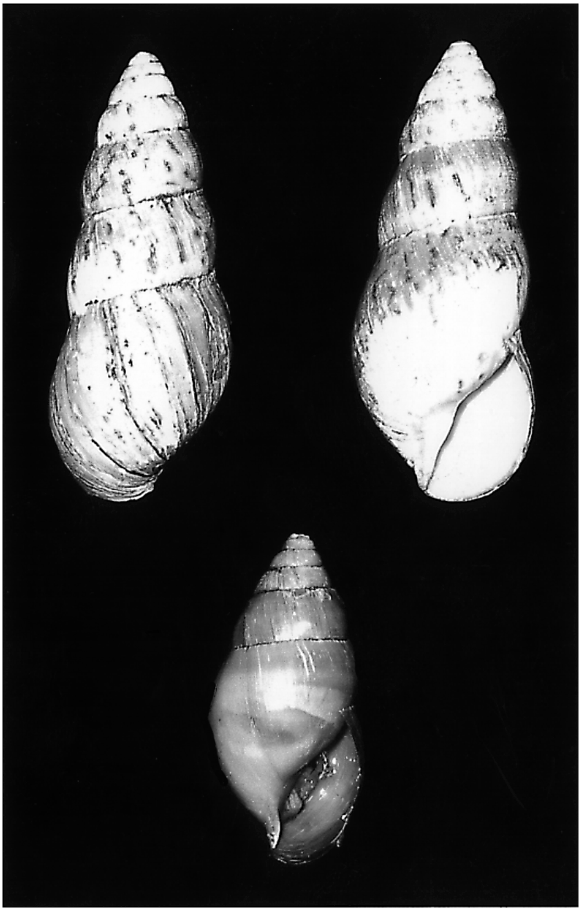

Fig. 1. Results of the breeding experiments with the *A. sanctaeluciae* morph. Top, the second generation resembling their parents. Bottom, one adult of the third generation exhibiting characters of *A. churchilliana.*

METHODS AND RESULTS

Two specimens of the typical slender form of *A. sanctaeluciae* were received from the vicinity of Mtubatuba at the beginning of 1999. These were used for breeding and produced a second generation which resembled the parent one (Fig. 1, top). Two specimens of this second generation were then inbred. Of the clutch of eggs obtained, a number of third generation snails hatched and reached different stages of development. Unfortunately only one was reared to full adulthood, and is one year old at this stage (January 2002). Although some of these third generation individuals had a flammulate shell pattern, similar to that of their parents, others were uniformly pale yellow in colour, without pattern. Even at a very young stage, some of the latter colour morph showed signs that the shell would have developed a less slender shape than that of their parents. It is one of these individuals that grew to adulthood (Fig. 1 bottom). On evaluating this snail on its shell characters (whorls 7.5; length 8.5 mm; diam. 30.2 mm; length/diam. ratio 2.27; length of last whorl 40.5 mm ; total length/length of last whorl 1.69), it was found to correspond to the descriptions of *A. churchilliana* instead of *A. sanctaeluciae* (see Sirgel 2000, table 6). Bearing in mind that the anatomy of the genital system of fully developed *A. churchilliana* resembles that of *A. sanctaeluciae* (see Sirgel 2000), it now seems proven beyond doubt that these two previously assumed distinct species are conspecific. This conclusion is supported by the statement of Allen (1985), which points out that the absence or presence of flammulation or banding is a widespread polymorphism among many species of pulmonates, including achatinids.

DISCUSSION

The fact that the yellow (*A. churchilliana)* morph is much less frequently found in collections than the striped (*A. sanctaeluciae*) morph, gives the impression that it is also much rarer in nature. This has been confirmed by field observations (R. Kilburn, *pers. comm.*). This observation, combined with the results of the above-mentioned breeding experiments, indicates that the uniformly pale *A. churchilliana* morph expresses a set of recessive traits. This is in accordance with the findings of Allen (1983 1985) and Barker (1968 1969), indicating that the absence of flammulation is controlled by an allele recessive to one for its presence in other achatinid species. Although the latter morph does not exhibit the more common, genetically dominant typical characters of the species, the name *Achatina* (now *Archachatina* (*Tholachatina*)) *churchilliana* (Melvill & Ponsonby, 1895) must take precedence over its junior synonym *A.* (*Tholachatina*) *sanctaeluciae* van Bruggen, 1989.

The wide variation in characters of the shell described above and often referred to in other species of Achatinidae (Connolly 1939; van Bruggen 1989), has further implications for *A. churchilliana* and other species alleged to be closely related to it. When *A. zuluensis* (Connolly, 1939) is taken into account, it is found that it resembles *A. churchilliana* more closely in shell shape than the latter resembles the typical slender *A. sanctaeluciae* (Sirgel 2000: figs 9 & 10), notwithstanding the fact that the latter two have now been proven to be synonyms. The claimed difference in profile of the apices of the shells of *A. zuluensis* and *A. sanctaeluciae* appears insufficient to accord them separate species status, as the Mapelane specimen noted by van Bruggen (1989) has a much more dome-shaped apex than either of these two, while it is difficult to decide to which taxon it should be referred using other characters.

The remaining characters used by van Bruggen (1989) to distinguish *A. zuluensis* and *A. sanctaeluciae* are: (1) the latter having a higher total length/length of the last whorl ratio, and (2) it showing a more pronounced basal twist to the columella. The latter character, however, may be structurally related to the first, as a relatively shorter last whorl should induce a more pronounced twist. For example, Connolly (1939: 299) points out that within the species *Achatina zebra* (Bruguiere, 1789), the columella is particularly concave in the more obese forms. It is thus strongly suggested that *A. zuluensis* (Connolly, 1939) is a second synonym of *A. churchilliana*, in view of similar variations in shell characters occurring within the latter species, and given that its genital system is similar.

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